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A NEW SPECIES OF *HORAIELLA* TONNOIR (DIPTERA: PSYCHODIDAE) FROM THAILAND

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Abstract.—The moth-fly genus *Horaiella* Tonnoir is reported for the first time from Thailand. Numerous adult specimens were collected in Malaise-trap samples from Khao Yai National Park, central Thailand, including males and females of a **new species, *Horaiella iota* Curler**. Genitalic characters of the male confirm that the Khao Yai specimens represent a new species. A description and a brief discussion of bionomics and comparison with other known species of *Horaiella* are given.

Key Words: *Horaiella*, Psychodidae, moth flies, Thailand

Tonnoir (1933) described the genus *Horaiella* from two species collected in the Teesta Valley of northern India, *H. prodigiosa* and *H. consimilis*. Subsequently, Alexander (1953) described *H. kuatunensis* from Fukien, China. Except for these descriptions, and despite the unusual structure and habitat of the immature stages, the genus remains poorly known and rarely collected.

Specimens recorded in this paper were collected during an inventory of stream-inhabiting Diptera of Khao Yai National Park (KYNP) in central Thailand. Established in 1962 and covering approximately 2,170 km^2, KYNP is the oldest and one of the largest parks in Thailand. The park includes parts of four provinces, Nakhon Ratchasima, Saraburi, Nakhon Nayok, and Prachinburi, and is known for its biotic diversity, especially its vertebrates and vegetation. Much of KYNP consists of a large sandstone plateau dissected by numerous streams and covered by tropical and submontane broad-leaved evergreen forests (Gray et al. 1994). The rich biota reflects partly the park's altitudinal diversity (60–1,350 m). Samples from two streams in KYNP yielded numerous adult specimens of *Horaiella iota*, a new species described herein. Though immature stages were not collected, adults of the present species exhibit sufficient differences in size, wing venation and terminalia to separate them from other described species of *Horaiella*.

MATERIAL AND METHODS

Specimens recorded in this paper were collected in Malaise traps set in July 2000 and checked every two weeks for one year (through June 2001). Traps were placed either over the stream or in riparian vegetation within 5 meters of the stream. These streams were located in Nakhon Nayok Province, as follows:

1) Huai Patabak near km 29 (= distance from south entrance of

KYNP), 14°19′N, 101°21′E, 505 m asl. This is a permanent stream, approximately 2–3.5 m wide, with substrata comprising mostly cobble and coarse gravel. Huai Patabak is in a moderately dense forest, which keeps the stream shaded throughout the year.

2) Small creek 6.2 km up Khao Khieo Road, 14°22′N, 101°24′E, 952 m asl. This is a temporary stream (4 months w/out surface flow) with a maximum width of approximately 2 m. Substrata are comprised mostly of cobble, boulders, and coarse gravels, and the riparian zone is well developed, providing dense shade throughout the year.

Specimens were collected and preserved in 70% EtOH. Slide-mounted material was cleared in cedarwood oil and mounted in Canada balsam, following procedures described elsewhere (Courtney 1990). Some adult specimens were dried chemically using hexamethyldisilazane, and mounted on pins. Specimens were examined using an Olympus SZX-12 dissecting microscope and a Nikon E-800 compound microscope, and drawings were rendered with the aid of a drawing tube on the Nikon system. Measurements are given in millimeters, as a mean followed by a range in parentheses where applicable. Values were recorded according to procedures outlined in Hogue (1973) and Courtney (2000) with the following exceptions: wing: length = point of greatest length, width = point of greatest width; head: length = posterior-most point of vertex to apex of mouthparts. Palpomere proportions are from basal to apical segments.

Horaiella iota Curler, new species

(Figs. 1–12)

Diagnosis.—A small *Horaiella. Male:* Palpus 3-segmented; wing length less than 2 mm; radial fork arising basal to the tip of R_{2+3}, medial fork arising apical to the tip of R_{2+3}; branches of medial fork divergent in comparison to those of radial fork; hypopygium with gonostyli straight, 9th tergite with lateral lobes elongate, directed laterally. *Female:* Palpus and wing characters identical to male; subgenital plate with a pair of smoothly-rounded posterior lobes.

Description.—Male: *Measurements* (N = 5): head length 0.25; wing length 1.48 (1.34–1.63); wing width 0.43 (0.39–0.49); leg segment lengths: forefemur 0.56 (0.51–0.62), tibia 0.45 (0.41–0.51), 1st tarsomere 0.20 (0.18–0.22), 2nd tarsomere 0.04, 3rd tarsomere 0.025, 4th tarsomere 0.02, 5th tarsomere 0.05; midfemur 0.66 (0.60–0.72), tibia 0.52 (0.47–0.57), 1st tarsomere 0.24 (0.22–0.27), 2nd tarsomere 0.04, 3rd tarsomere 0.025, 4th tarsomere 0.02, 5th tarsomere 0.05; hind femur 0.70 (0.64–0.77), tibia 0.53 (0.49–0.60), 1st tarsomere 0.26 (0.25–0.28), 2nd tarsomere 0.04, 3rd tarsomere 0.025, 4th tarsomere 0.02, 5th tarsomere 0.05

Head (Fig. 1): Eyes rounded, dichoptic, widely separated; antenna 17-segmented; scape wide basally, constricted apically; pedicel globular; flagellomere one about 1.5× as long as each of flagellomeres 2–5, flagellomeres 6–12 gradually decreasing in length, flagellomere 13 slightly wider than preceding segments, flagellomere 14 slightly longer

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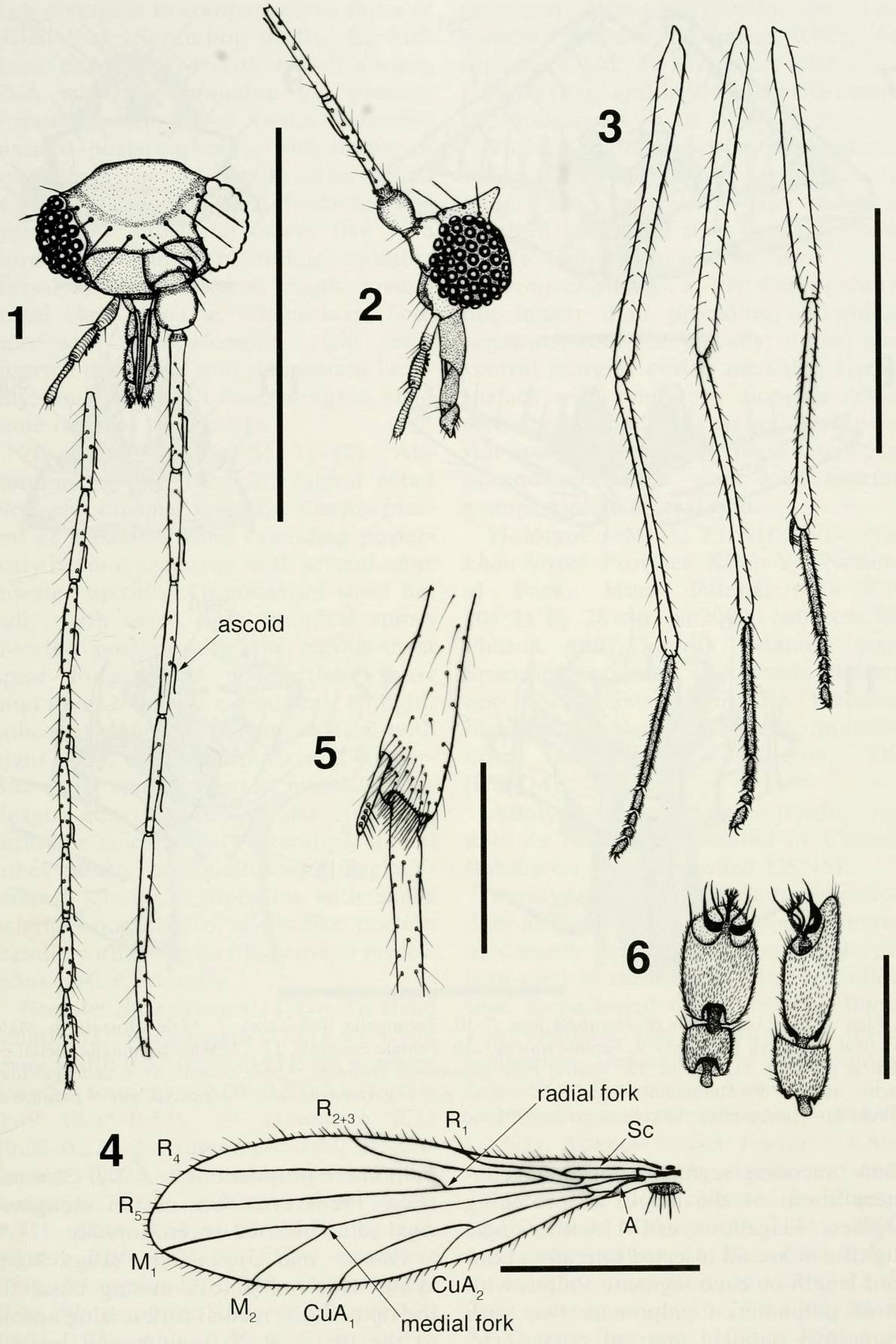
Figs. 1–6: *Horaiella iota*. 1–2, Heads. 1, Male with complete antenna (frontal view). 2, Female with partial antenna (lateral view). 3, Male legs (foreleg on right). 4, Male wing. 5, Apex of foretibia (medial view). 6, Tarsomeres 5 and 6 (ventral view on left, lateral view on right). Figs. 1–4 scale bars = 0.5 mm; Fig. 5 scale bar = 0.1 mm; Fig. 6 scale bar = 0.05 mm.


1
ascoid
2
3
5
6
4
radial fork
R_{2+3}
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M_2
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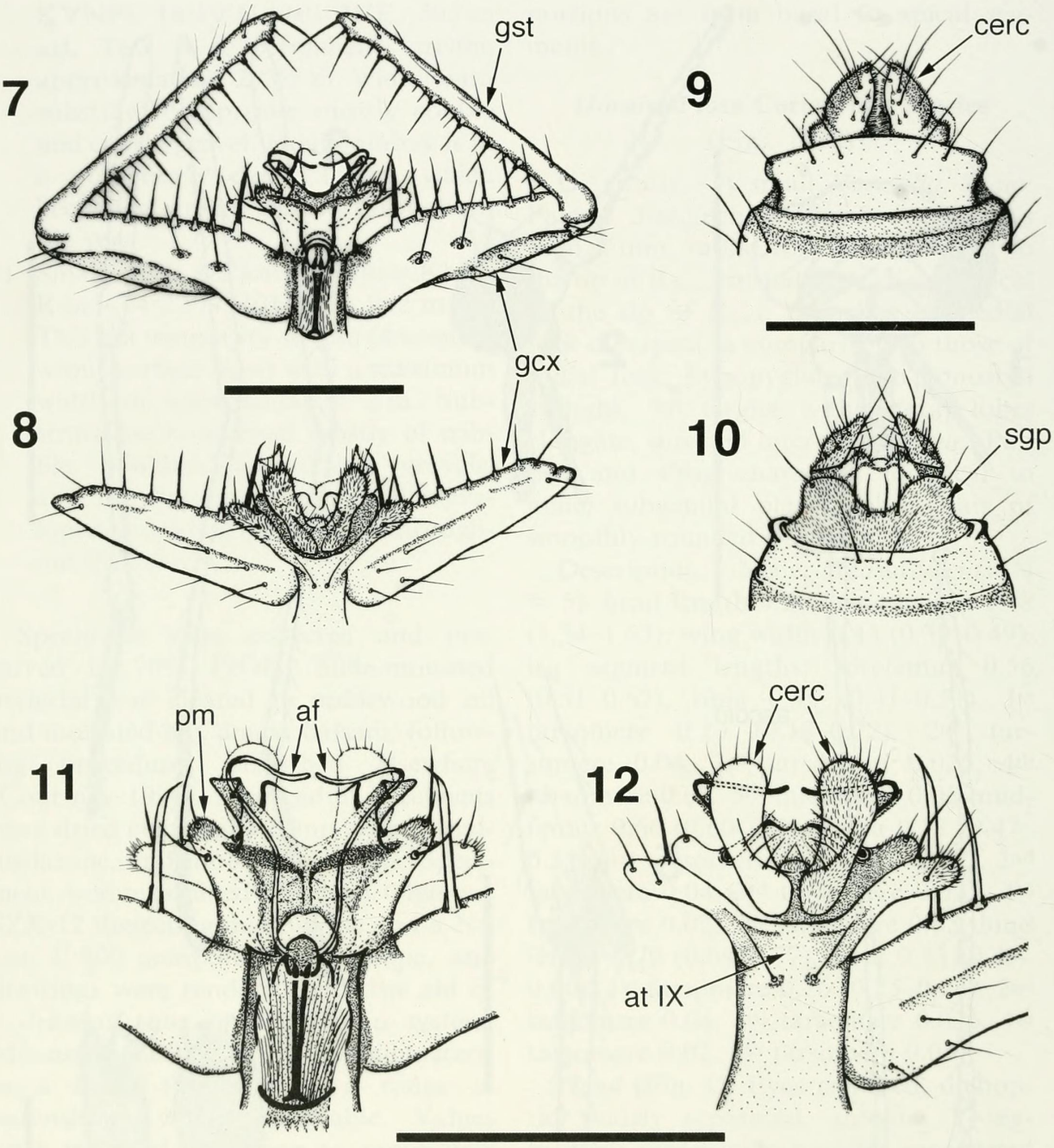
medial fork



Figs. 7–12: Terminalia of *Horaiella iota*. 7–10, Terminalia (full view). 7, Male (dorsal). 8, Male (ventral, gonostyli removed). 9, Female (dorsal). 10, Female (ventral). 11–12, Male terminalia (detail of central portion). 11, Dorsal. 12, Ventral right gonocoxite removed. Abbreviations: af = aedeagal filaments, at IX = 9th abdominal tergite, cerc = cerci, gcx = gonocoxite, gst = gonostyli, pm = parameral lobes, sgp = subgenital plate. Scale bars = 0.1 mm.

than preceding segment, apical flagellomere about ⅓ the length of preceding segment. Flagellomeres 1–13 with a single digitiform ascoid inserted laterally about mid-length on each segment. Palpus with three palpomeres; palpomere two with numerous papillae inserted posteriorly; palpomere proportions 1–1–1.2. Chaetotaxy: Transverse row of ten elongate, rigid setae inserted anterodorsally.

Thorax and appendages (Figs. 3–6): Wing with radial fork arising basal to the tip of R_{2+3}, medial fork arising apical to the tip of R_{2+3}; branches of medial

fork divergent in comparison to those of radial fork; Sc ending in R_1, R_s with three branches, M with two branches, CuA with two branches, A_1 present. Foretibia with strigil (*sensu* Tonnoir) inserted posteroapically, with a row of four spines inserted distally on its medial surface. All legs with tarsomeres 2–4 remarkably short; tarsomere five with dorsomedial lip protruding apically. Tarsal claws of unequal length, medial tarsal claw elongate. Chaetotaxy: Scutum with four elongate, rigid setae inserted anteriorly and six inserted laterally; scutellum with four elongate, rigid setae inserted posteriorly.

Terminalia (Figs. 7–8, 11–12): Abdominal tergite IX with lateral lobes elongate, directed laterally. Cercus present as a pair of lobes extending posteriorly beyond aedeagus, with several setae inserted apically. Gonocoxites stout basally, with seven rigid, elongate spines inserted posteriorally, the medial-most spine longer and wider than those laterally. Gonostyli cylindrical, straight, subequal in length to gonocoxites, with eight rigid, elongate spines and numerous short spines inserted medially. Aedeagus contained in tubular structure, bifurcate apically, with lateral parameral lobes basally; basiphallus with single Y-shaped sclerite; distiphallus with single sclerite consisting of a disclike portion basally with elongate filamentous projections posterolaterally.

Female: *Measurements* (N = 5): Head length 0.33; wing length 1.79 (1.69–1.90); wing width 0.57 (0.53–0.61); leg segment lengths: forefemur 0.60 (0.55–0.65), tibia 0.49 (0.45–0.53), 1st tarsomere 0.21 (0.20–0.22), 2nd tarsomere 0.04, 3rd tarsomere 0.025, 4th tarsomere 0.02, 5th tarsomere 0.05; midfemur 0.68 (0.63–0.71), tibia 0.54 (0.51–0.57), 1st tarsomere 0.26 (0.24–0.27), 2nd tarsomere 0.04, 3rd tarsomere 0.025, 4th tarsomere 0.02, 5th tarsomere 0.05; hind femur 0.72 (0.71–0.75), tibia 0.56 (0.53–0.57), 1st tarsomere 0.28 (0.27–0.29), 2nd tarsomere 0.04, 3rd tarsomere 0.025, 4th tarsomere 0.02, 5th tarsomere 0.05

Head (Fig. 2): Identical to male except the mouthparts about 1.32× longer.

Thorax and appendages: Wing identical in shape, but slightly larger than in male. Legs identical in shape and proportion, but longer than in male. Chaetotaxy: Identical to that in male.

Terminalia (Figs. 9–10): Cercus short, not longer than preceding abdominal segments, rounded apically; dorsal and ventral margins curled medially; lateral surface with numerous elongate setae, medial surface with dense setulae. Posterior margin of subgenital plate with a pair of rounded lobes, each lobe bearing a single posterolateral seta.

Holotype.—Male. THAILAND. *Nakhon Nayok Province*: Khao Yai National Park, Huai Patabak, 14°19′N 101°21′E, 28.x–11.xi.2000, collected by Phasuk and Damrak, Malaise trap. Specimen mounted in Canada Balsam on slide, deposited in the National Museum of Natural History, Smithsonian Institution, Washington, DC [USNM].

Allotype.—Female. same locality and date as holotype, mounted in Canada Balsam on slide, deposited USNM.

Paratypes.—4 ♂, 4 ♀. Same collection data as holotype and allotype, mounted in Canada Balsam on slides. Paratypes deposited in the National Insect Collection, Department of Agriculture, Bangkok, Thailand, and the Iowa State Insect Collection, Department of Entomology, Iowa State University, Ames, IA.

Other material examined.—THAILAND. *Nakhon Nayok Province*. Khao Yai National Park, Huai Patabak, 14°19′N 101°21′E, collected by Phasuk and Damrak, Malaise trap, 2–16.ix.2000, 1 ♂; same location, 16–30.ix.2000, 2 ♂, 2 ♀; same location, 30.ix–16.x.2000, 13 ♂, 7 ♀; same location, 16–28.x.2000, 28 ♂, 31 ♀; same location, 11–25.xi.2000, 1 ♂,

1 ♀; same location, 25.xi–9.xii.2000, 5 ♂, 3 ♀; Khao Yai National Park, creek 6.2 km up Khao Khieo road, 14°22′N 101°24′E, collected by Phasuk and Damrak, Malaise trap, 16–28.x.2000, 1 ♀; same location, 11–25.xi.2000, 1 ♀. Other material deposited in the Department of Entomology, Kasetsart University, Bangkok, Thailand, the Iowa State Insect Collection, Department of Entomology, Iowa State University, Ames, IA, and the Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN.

Etymology.—"Iota" is a Greek term that is used as both a number and a term to describe a very small amount of something. *Horaiella iota* is remarkably small in comparison to other members of the genus, hence the species name.

Distribution.—This species is currently known only from two locations at Khao Yai National Park in central Thailand; however, it may occur in the surrounding areas as well.

Bionomics.—Although Malaise traps were maintained throughout the year 2000, *H. iota* was captured only from September to December, with the greatest number of captures during mid- to late October. This suggests a univoltine life cycle and a peak activity period that coincides with the post-monsoon; however, collection of the immature stages will provide a more exact assessment of phenology.

Taxonomic notes.—Adults of *H. iota* are distinct among known species of *Horaiella* due to their small size and characters of the wing veins (e.g., radial fork arising basal to the medial fork). For the male, notable affinities are with *H. consimilis* and *H. prodigiosa*, the former being most similar to *H. iota* with respect to the structure of the 9th tergite, cerci and aedeagus. *Horaiella iota* females are similar to those of *H. prodigiosa*, but differ in the shape of the subgenital plate (in *H. iota*, the posterior lobes are rounded and about as wide as long).

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